# CATALYTIC EFFECT OF POTASSIUM CARBONATE ON CONDENSABLE SPECIES RELEASED DURING WOOD TORREFACTION

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Influence of alkali metals on the pyrolysis of biomass has been widely studied and the catalytic role of potassium in char formation at the expense of pyrolysis liquid yield has been reported ([1], [5], [6]). Studies have shown an opposite effect during torrefaction, with an increase in mass loss with potassium addition ([3], [7]). In these conditions, shorter residence times can be considered in future torrefaction plants as well as lower temperatures to obtain the desired solid yield. These torrefaction studies, however, have not analyzed the effect of potassium addition on the composition and yield of condensable species. Increasing potassium content may enhance lignin derivatives yield during pyrolysis ([2], [4]). Some of these pyrolytic compounds are recognized as valuable chemicals. In this sense, the chemical valorization of lignin-derivatives such as eugenol, isoeugenol, guaiacol, vynil-guaiacol, syringol, syringaldehyde, vanillin, could be considered for enhancing economic viability in futures torrefaction plants, in addition to torrefied biomass. Therefore, to analyze the influence of potassium content on condensable species released during wood torrefaction, two demineralized wood species were impregnated with three different concentrations of K2CO3 and then torrefied at 275°C up to an anhydrous weight loss (AWL) of 25%. Torrefaction was carried out in both a thermogravimetric analysis (TGA) instrument and a laboratory fixed-bed reactor. Condensates from the fixed bed reactor were collected and analyzed by Gas Chromatography-Mass Spectroscopy (GC-MS).

TG analysis revealed that AWL increased with the increasing in potassium content and consequently shorter torrefaction times were required for obtaining the targeted AWL. GC-MS showed that potassium has a remarkable catalytic effect on the decrease of anhydrosugars (principally levoglucosan) formation, corroborating results obtained under pyrolysis conditions. The amount of low molecular compounds including acetic acid, acetol and glycoaldeyde as well as some lignin derivatives such as guaiacol, syringol and 4-Vinylguaiacol increased in proportion to potassium content. These results may suggest that low additions of K could lead to obtaining the desired solid yield with shorter torrefaction times and simultaneously improving the yields of valuable compounds such as guaiacol and syringol in future torrefaction plants.

References

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